WOOD STRUCTURE OF TRIGONOBALANUS EXCELSA G. LOZANO-C., HDZ-C. & HENAO *(FAGACEAE)*

By

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General characters: Hardly any differentiation in sapwood and heartwood. The wood greyish middle brown, with a reddish tinge. On the transverse surface growth rings not visible, the wide rays distinct with the naked eye as lighter coloured stripes. The grain straight, the texture rather fine; very hard and difficult to cut across the grain.

Microscopic characters: *Growth rings* fainly indicated by narrow zones of fibre tissue devoid of parenchyma, and with very few vessels; the vessel size without relation to early or late wood. *Vessels* (Figs. 1, 2) solitary, arranged in a more or less radial or slightly diagonal pattern, 3.6 per sq. mm on the average, varying from 1 to 8, due to the irregular distribution. Round or oval in transverse section; of two sizes, the widest vessels ranging from 140 to 200 μm, the small ones *ca.* 70 μm wide. Intervascular pits not noticed or confined to the narrow pointed tips of the vessel members; the pits to the vascular tracheids round, bordered, 6-7 μm wide, with a slit-like aperture (Fig. 5). *Perforation plates* almost horizontal to slightly oblique, the perforations simple (Fig. 6). Vessel member length 1020 (750-1.180) μm on the average. Thin tyloses frequently present. *Tracheids* form a mostly incomplete, one or two cells wide sheath around the vessels; walls *ca.* 4 μm wide; length 1.100 μm; pits to vessels 6-7 μm wide. *Fibre tissue* chiefly consisting of fibre tracheids intermingled with some libriform fibres; thick-walled, in transverse section 5-6-angled, diameter 18-21 μm, average length 1.640 (1.350-1.825) μm, walls about 8 μm thick; pits of the fibre tracheids resembling the pits of the vascular tracheids in size, the apertures slit-like and reaching the border, present on both radial and tangential walls. Fibre/vessel member length ratio 1.6. Rays of two types, uniseriates and broad aggregate rays. The uniseriates composed of upright, square and procumbent cells, the latter type rather short in radial direction and relatively high in axial direction; 12-16 μm wide; from 2 to 35 cells high (100-960 μm); 14 (11-17) per mm. The aggregate rays consisting of multiseriate rays of various width and height (Figs. 2, 4) and including fibres and

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occasionally some parenchyma. The rays composed of procumbent and square cells of rather irregular dimensions; width of the individual rays 3 to 11 cells (25-120 μm); height 0.5-4.5 mm; average number 2 per 5 mm. Pits to vessels large, elliptic, horizontally, diagonally or vertically orientated irrespective of the cell type, several in a cross field area (Fig. 3). Clustered crystal-like inclusions present in slightly inflated square cells. Parenchyma apotracheal in rather numerous, uniseriate or occasionally biseriate, very short of short, tangential, straight of more or less undulating bands that form a conspicuous though irregular pattern on the transverse section (Figs. 1, 2). The strands usually 8 (4-12) cells long; some cells chambered and containing a large rhombic crystal (Fig. 7).

Material examined: A trunk 13 cm in diameter, from the paratype *Henao s.n.* (COL 188721).

REMARKS.

On account of the wood structure the material, suggested to belong to the Fagaceae, is related either to *Quercus* or to *Trigonobalanus,* and not to *Fagus* or *Nothofagus.* The former two genera are e.g. characterized by a special vessel distribution as opposed to the random distribution in *Fagus* and *Nothofagus.* Furthermore, the presence of aggregate rays is a feature encountered in *Quercus* and *Trigonobalanus* and not in the other two genera. An extensive amount of literature exists which deals with the structure and properties of oak and beech wood (e.g. Jane, 1970; Janssonius, 1936; Metcalfe & Chalk, 1950; Panshin & de Zeeuw, 1970; Record & Hess, 1943). Few papers on the other hand deal with the anatomy of *Nothofagus* or *Trigonobalanus,* but from Dadswell & Ingle's (1954) extensive treatment of *Nothofagus* and from Cutler's papers (1964, 1967) on *Trigonobalanus,* as well as Burgess' (1966) description of the timber I feel justified to suggest to accommodate the unknown specimen in the genus *Trigonobalanus.*

The anatomical features of the woods of some tropical species of *Quercus,* and of *Lithocarpus* and *Trigonobalanus* were compared by Cutler (1964). From the great similarity in wood structure, and partly overlapping characters of the three genera, his main conclusion was "that the wood of the new genus *Trigonobalanus* is so similar to that of certain tropical species of *Quercus* and *Lithocarpus* that it could fit in either genus". Based on exomorphic evidence, Forman (1964), however, treated *Trigonobalanus* as a distinct genus, closely allied to *Quercus.*

Cutler's (1964, 1967) description of the wood of *Trigonobalanus verticillata* Forman (the only species of which mature wood is known) does not match the Colombian material in all respects, which is hardly surprising. The

main differences are the smaller number of vessels per sq. mm in the present material, the longer vessel element length, and the almost always one cell wide parenchyma bands, which in *T. verticillata* are from one to four cells wide. These slight differences can easily be accounted for as specific variation.

The great conformity in wood structure of the material at hand and of *T. verticillata* as based on Cutler's papers was the principal motivation for the present author to assign the wood specimen to *Trigonobalanus* and not to *Quercus,* nor to *Lithocarpus,* which has more numerous vessels and more pronounced growth rings. Furthermore, a comparison of the specimen with wood of several tropical species of *Quercus* gave the impression that a difference exists in vessel distribution, in number of the vessels, and in the colour and aspect of the timber. Admittedly these are not very important characters, but in view of Cutler's conclusion cited above, more fundamental differences could hardly be expected.

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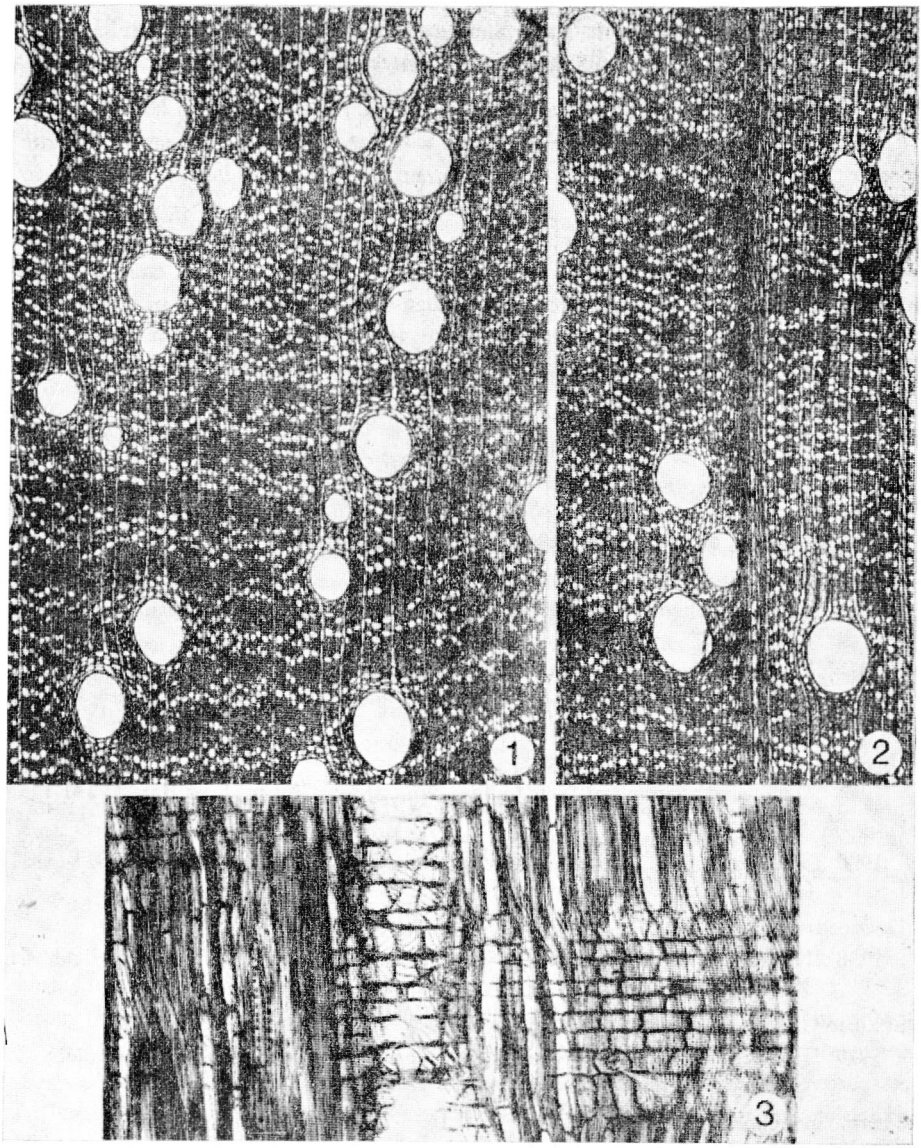

FIGS. 1 and 2. Transverse sections, x 40. In fig. 2 one wide aggregate ray. FIG. 3. Radial section, x 100. Large, obliquely orientated pits between rays and vessels; fibre tracheids with round bordered pits; one ray cell with a crystal-like inclusion (arrow).

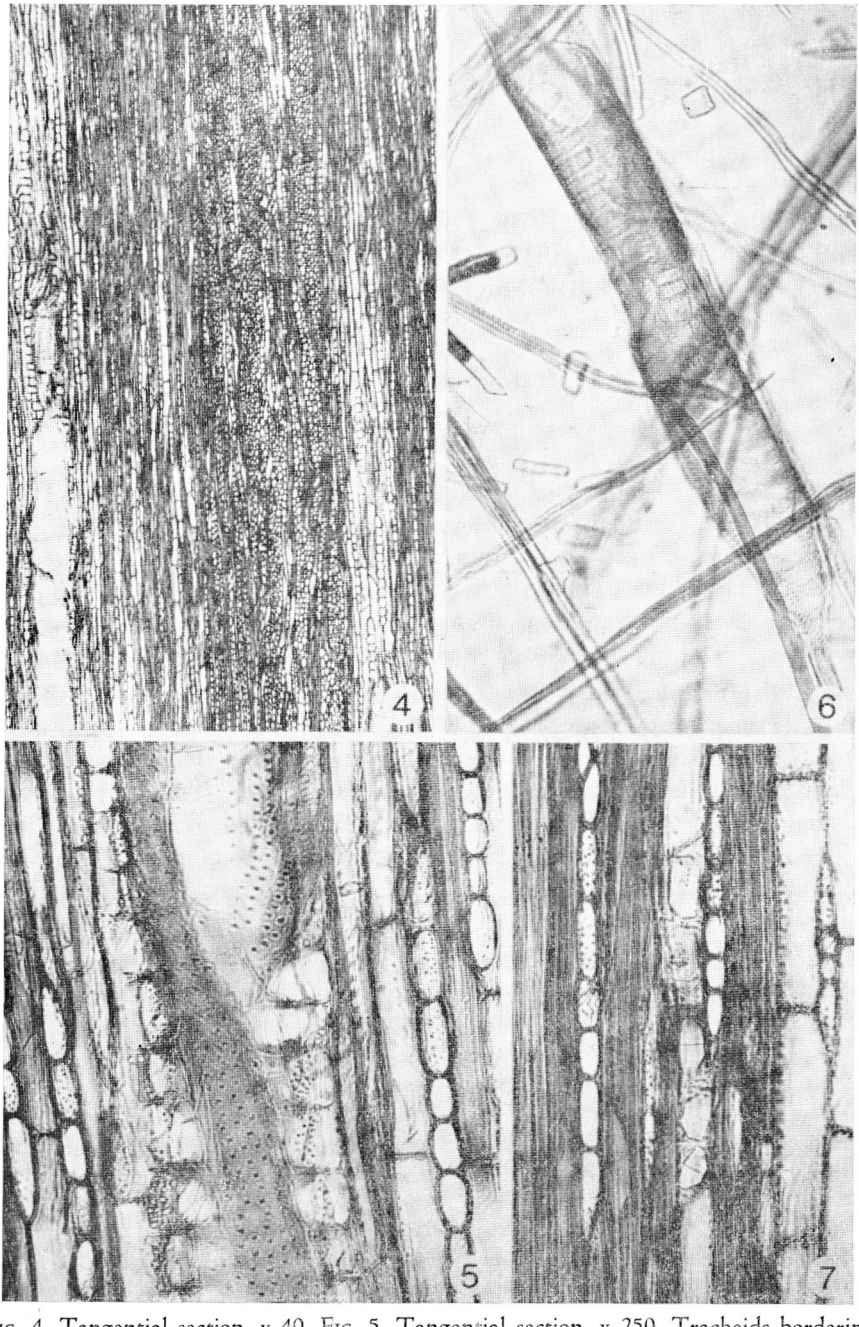

FIG. 4. Tangential section, x 40. FIG. 5. Tangential section, x 250. Tracheids bordering on a vessel. FIG. 6. Macerated wood, x 100. Vessel member and some fibre tracheids. FIG. 7. Tangential section, x 250. Large rhombic crystals in cells of a parenchyma strand.